Spot Safety Project Evaluation

Project Log # 200508007
Spot Safety Project # 13-97-007

**Spot Safety Project Evaluation, of the Traffic Signal Installation,
At the Intersection of US 25-Hendersonville Road and I-40 Eastbound Off Ramp,
In Asheville, Buncombe County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ ___8/26/05___
Carrie L. Goodrich Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 13-97-007– The Intersection of US 25-Hendersonville Road and I-40 Eastbound Off Ramp, in Asheville, Buncombe County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis has been completed to measure the effectiveness of the spot safety improvement. Additional analysis methods were not utilized for this evaluation because a suitable comparison group was unattainable. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a two-phase actuated traffic signal. K.J. Putnam, Division Traffic Engineer, originally requested the improvement. US 25-Hendersonville Road is a four-lane divided facility with a speed limit of 35 mph within the vicinity of the intersection. Prior to the spot safety improvements, the subject location was controlled by dually posted stop signs on the I-40 Eastbound Off Ramp.

The treatment location satisfied the following signal warrants:

Warrant 1 – Minimum Vehicular Volumes
Warrant 2 – Interruption of Continuous Traffic
Warrant 6 – Accident Experience
Warrant 8 – Combination of Warrants
Warrant 9 – Four-Hour Volumes
Warrant 11 – Peak Hour Volumes

The initial crash analysis for this location was completed from January 1, 1993 through July 31, 1996 with a total of 33 reported crashes. According to the initial crash analyses, nine of these crashes were Angle Crashes and fifteen were Rear End Crashes. Excessive side street delay was also a problem at the location. The final completion date for the improvement at the subject intersection was on January 23, 1998.

Naïve Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from December 1, 1997 through February 28, 1998. The before period consisted of reported crashes from December 1, 1991 through November 30, 1997 (6 Years) and the after period consisted of reported crashes from March 1, 1998 through February 28, 2004 (6 Years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The treatment data consisted of the following crashes:

1. Crashes involving vehicles travelling on I-40 Eastbound Off Ramp and/or southbound US 25-Hendersonville Road within 150 feet of the subject intersection, AND

2. Crashes involving vehicles merging from the left-turn acceleration lane to northbound US 25,

3. Excluding several crashes on southbound US 25- Hendersonville Road that occurred south of the subject intersection and did not pertain to the treatment location.

Please see attached *Location Map* for further detail. The following data table depicts the Naive Before and After Analysis for the treatment intersection. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information

	Before	**After**	**Percent Reduction (-)/ Percent Increase (+)**
Total Crashes	55	15	- 72.7
Total Severity Index	6.85	4.45	- 35.0
Frontal Impact Crashes	19	2	- 89.5
Frontal Severity Index	12.09	4.70	- 61.1
Rear End Crashes	29	10	- 65.5
Volume	25,300	33,000	30.4

The naive before and after analysis at the treatment location resulted in a 72.7 percent decrease in Total Crashes, a 35.0 percent decrease in the Total Severity Index, and a 30.4 percent increase in Average Daily Traffic (ADT). In addition, the number of Frontal Impact Crashes decreased by 89.5 percent and the number of Rear End Crashes decreased by 65.5 percent from the before to the after period. The before period ADT year was 1994 and the after period ADT year was 2001.

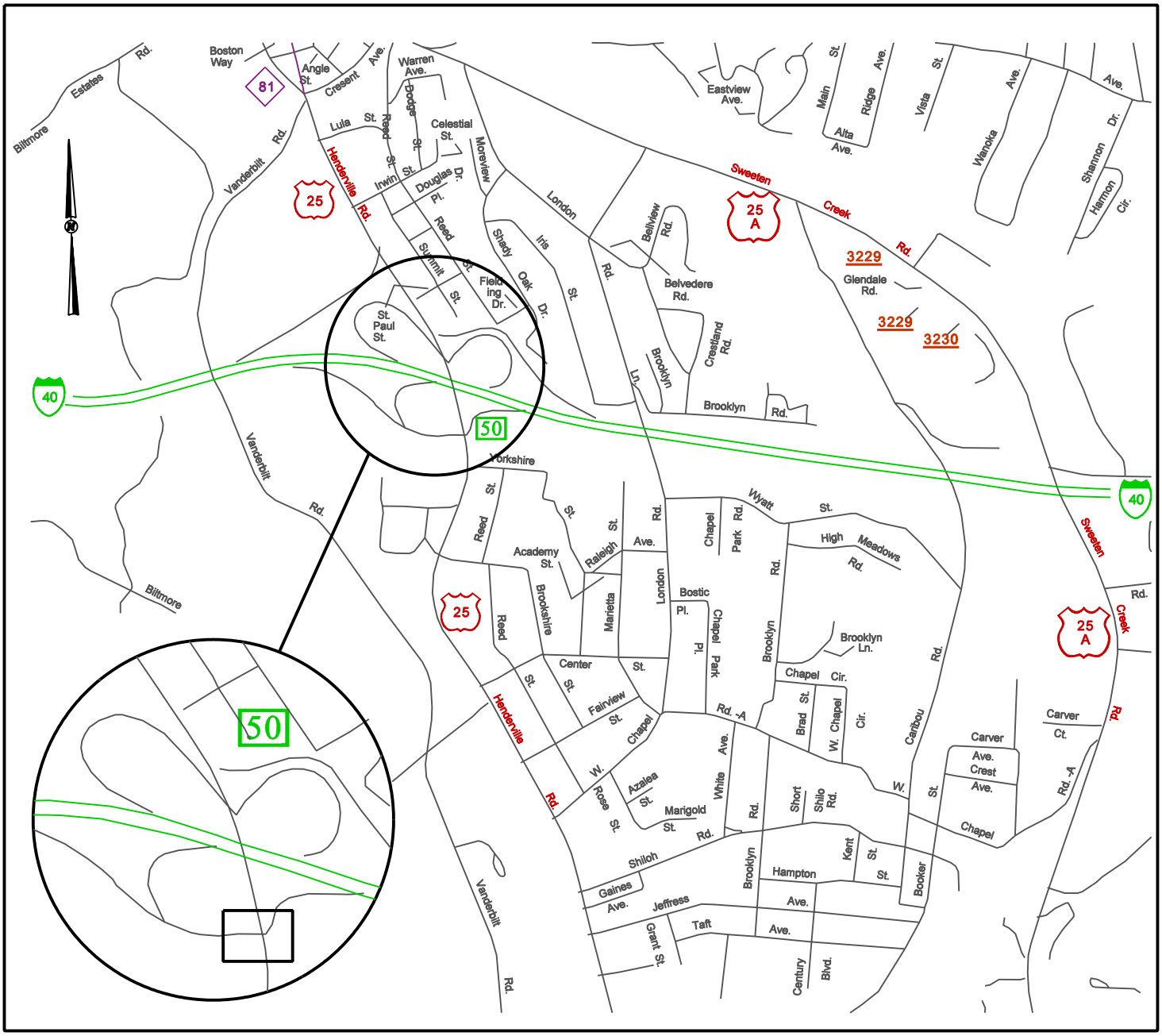
Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 72.7 percent decrease in Total Crashes and an 89.5 percent decrease in Frontal Impact Crashes. In addition, the number of Rear-End crashes at the treatment location decreased by 65.5 percent. The summary results above demonstrate that the treatment location appears to have had a substantial decrease in all crash types since the traffic signal installation.

Analysis of several significant crash patterns reveals that the number of Rear End crashes between vehicles exiting the Off-Ramp decreased (by 85.7 percent) from 28 crashes in the before period to four crashes in the after period. Also, the number of Frontal Impact crashes between Off Ramp vehicles and southbound US 25 vehicles decreased (by 89.5 percent) from 19 crashes in the before period to 2 crashes in the after period. Surprisingly, few crashes were caused by vehicles merging from the left turn acceleration lane onto US 25 northbound. In the before and after periods combined, only three crashes were caused by this movement. Please see the attached Before and After Collision Diagrams for a visual display of this crash analysis information.

The countermeasure crash reduction for Total Crashes at the subject intersection is a 72.7 percent decrease in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection is an 89.5 percent decrease in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors.

Location Map, in Asheville, Buncombe County
Evaluation of Spot Safety Project Number 13–97–007



Treatment Site:

US 25–Hendersonville Road at I–40 Eastbound Off Ramp

Treatment Site Photos (Taken on July 28, 2005)

Driving southbound on US 25-Hendersonville Road towards the Treatment Intersection.
Notice the Signal Ahead Warning Sign.

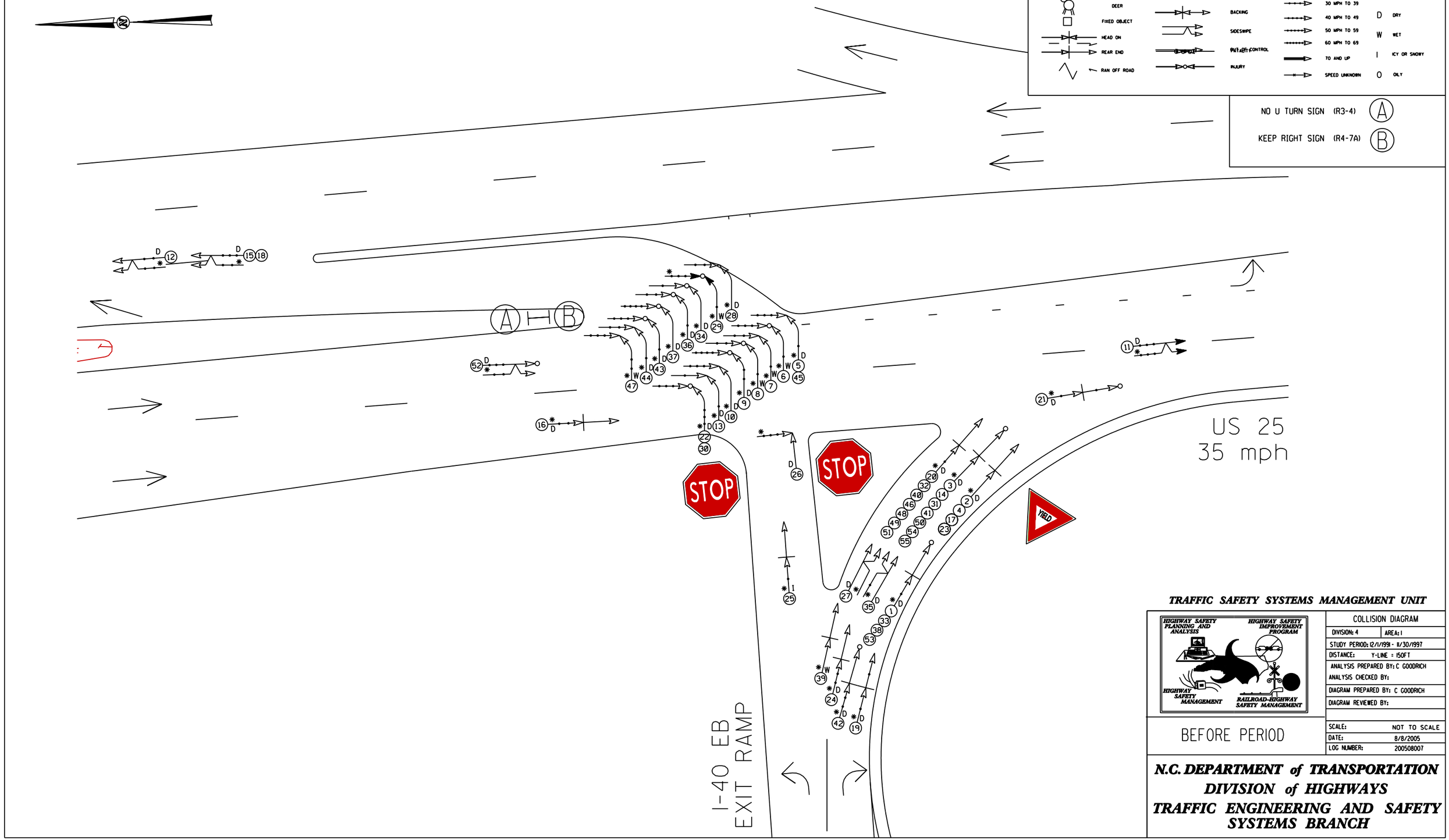
Driving southbound on US 25-Hendersonville Road approaching the Treatment Intersection.

Treatment Site Photos (Taken on July 28, 2005)

Driving southbound on US 25-Hendersonville Road stopped at the Treatment Intersection.

Driving northbound on US 25-Hendersonville Road towards the Treatment Intersection. Notice the vehicle above getting ready to merge with the northbound travel lanes.

TREATMENT SITE-TOTAL CRASHES-BEFORE PERIOD
(12/1/1991 THROUGH 11/30/1997 - 6 YEARS)



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY PLANNING AND ANALYSIS
HIGHWAY SAFETY IMPROVEMENT PROGRAM
HIGHWAY SAFETY MANAGEMENT
RAILROAD-HIGHWAY SAFETY MANAGEMENT

BEFORE PERIOD

COLLISION DIAGRAM	
DIVISION: 4	AREA: I
STUDY PERIOD: 12/1/1991 - 11/30/1997	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: C GOODRICH	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: C GOODRICH	
DIAGRAM REVIEWED BY:	
SCALE:	NOT TO SCALE
DATE:	8/8/2005
LOG NUMBER:	20050807

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DIVISION of HIGHWAYS
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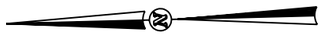
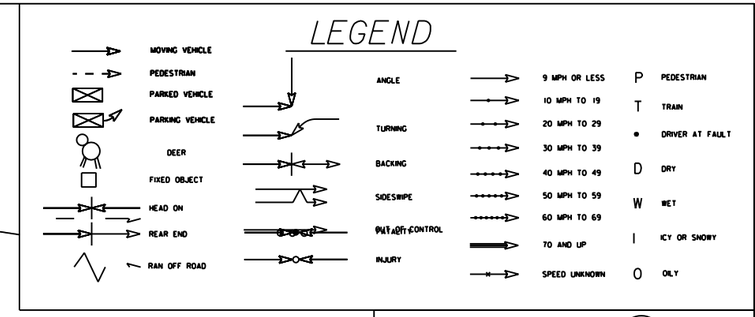
TREATMENT SITE-TOTAL CRASHES-AFTER PERIOD
(3/1/1998 THROUGH 2/28/2004 - 6 YEARS)





NO U TURN SIGN (R3-4) (A)

KEEP RIGHT SIGN (R4-7A) (B)

SIGNAL FACE I.D.

11, 12
21, 22

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM

DIVISION: 4	AREA: I
STUDY PERIOD: 3/1/1998 - 2/28/2004	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: C GOODRICH	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: C GOODRICH	
DIAGRAM REVIEWED BY:	
SCALE:	NOT TO SCALE
DATE:	8/8/2005
LOG NUMBER:	200508007

AFTER PERIOD

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